

NEW PCT/GB00/01162 APPLICATION  
Preliminary Amendment  
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of the one of the relatively shallow ramp surface or parallel surface; a window mill secured to the whipstock adjacent the relatively steep ramp surface and operable in use to form an opening in a wellbore casing in which the whipstock casing milling system is located, the window mill being deflected by the relatively steep ramp surface laterally into the casing as the window mill is rotated about the rotational axis thereof and forced along the relatively steep ramp surface towards the one of the relatively shallow ramp or parallel surface; and a protrusion provided on the whipface, the protrusion forming an extension of the relatively steep ramp surface of the whipface, wherein during use of the system, the diameter of the window mill is greater than the distance from the juncture to the radially opposite outwardly facing surface of casing, and wherein the protrusion reduces damage to the relatively steep ramp surface.

2. A whipstock casing milling system as claimed in claim 1, wherein the window mill comprises a cutting surface arranged with an angle to the rotational axis of the window mill substantially identical to an angle of the relatively steep ramp surface to the longitudinal axis of the whipstock, said cutting surface occupying an annular zone centered on the rotational axis of the window mill and having a radial thickness greater than a radial thickness of the protrusion.

3. A whipstock casing milling system as claimed in claim 1, wherein the protrusion is provided on the one of the relatively shallow ramp or parallel surface of the whipface.

4. A whipstock casing milling system as claimed in claim 1, wherein the protrusion is removably secured to the whipface.

5. A whipstock casing milling system as claimed in claim 3, wherein the protrusion is removably secured to the whipface by means of at least one threaded fastener.

6. A whipstock casing milling system as claimed in claim 1, wherein the protrusion comprises a surface which is ramped at the same angle relative to the longitudinal axis of the whipstock as the relatively steep ramp surface.

7. A whipstock casing milling system as claimed in claim 6, wherein said ramped surface of the protrusion and the relatively steep ramp surface are ramped at an angle of  $15^\circ$  relative to the longitudinal axis of the whipstock.

8. A method of using a whipstock casing milling system for forming a window in the casing of a wellbore, the casing having an inwardly facing surface which defines the inside diameter of the casing and an outwardly facing surface which defines the outside diameter of the casing, the whipstock casing milling system comprising: a whipstock having a whipface, the whipface comprising a relatively steep ramp surface and one of a relatively shallow ramp surface or parallel surface meeting the relatively steep ramp surface at a juncture, said surfaces being one of ramped or parallel relative to a longitudinal axis of the whipstock, and the relatively steep ramp surface having an angle to the longitudinal axis of the whipstock greater than that of the one of the relatively shallow ramp surface or parallel surface; a window mill secured to the whipstock adjacent the relatively steep ramp surface and operable in use to form an opening in a wellbore casing in which the whipstock casing milling system is located, the window mill by the relatively steep ramp surface laterally into the

casing as the window mill is rotated and forced along the relatively steep ramp surface towards the one of the relatively shallow ramp or parallel surface; and a protrusion provided on the whipface, the protrusion forming an extension of the relatively steep ramp surface of the whipface during use of the system; wherein the method comprises the step of locating said whipstock casing milling system in a wellbore casing so that the juncture and the radially opposite outwardly facing surface of casing are spaced from one another by a distance less than the diameter of the window mill.

9. A whipstock casing milling system comprising: a whipstock having a whipface, the whipface comprising a relatively steep ramp surface and one of a relatively shallow ramp surface or parallel surface meeting the relatively steep ramp surface at a juncture, said surfaces being one of ramped or parallel relative to the longitudinal axis of the whipstock and the relatively steep ramp surface having an angle to the longitudinal axis of the whipstock greater than that of the relatively shallow ramp surface or parallel surface; a window mill secured to the whipstock adjacent the relatively steep ramp surface and operable in use to form an opening in a wellbore casing in which the whipstock casing milling system is located, the window mill being deflected by the relatively steep ramp surface laterally into the casing as the window mill is rotated and forced along the relatively

steep ramp surface towards the relatively shallow ramp or parallel surface; and a protrusion provided on the whipface, the protrusion forming an extension of the relatively steep ramp surface of the whipface so as to reduce damage to the relatively steep ramp surface at the juncture of the relatively steep ramp surface and the relatively shallow ramp or parallel surface during use of the system; wherein the protrusion and whipstock are discrete components.

10. A whipstock casing milling system as claimed in claim 9, wherein the window mill comprises a cutting surface arranged with an angle to the rotational axis of the window mill substantially identical to the angle of the relatively steep ramp surface to the longitudinal axis of the whipstock, said cutting surface occupying an annular zone centered on the rotational axis of the window mill and having a radial thickness greater than the radial thickness of the protrusion.

11. A whipstock casing milling system as claimed in claim 9, wherein the protrusion is provided on the relatively shallow ramp or parallel surface of the whipface.

12. A whipstock casing milling system as claimed in claim 9, wherein the protrusion is removably secured to the whipface.

13. A whipstock casing milling system as claimed in claim 12, wherein the protrusion is removably secured to the whipface by means of at least one threaded fastener.

14. A whipstock casing milling system as claimed in claim 9, wherein the protrusion comprises a surface which is ramped at the same angle relative to the longitudinal axis of the whipstock as the relatively steep ramp surface.

15. A whipstock casing milling system as claimed in claim 14, wherein said ramped surface of the protrusion and the relatively steep ramp surface are ramped at an angle of  $15^\circ$  relative to the longitudinal axis of the whipstock.

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